

Book Notes

Proceedings of the 1962 Heat Transfer and Fluid Mechanics Institute, edited by F. Edward Ehlers, James J. Kauzlarich, Charles A. Sleicher Jr., and Robert E. Street (Stanford University Press, Stanford, Calif., 1962), 294 pp. \$8.50.

Contents: 19 papers contributed by different authors. 1) Detailed Flow Field in Transition; 2) Effectiveness as a Universal Measure of Mass Transfer Cooling for a Turbulent Boundary Layer; 3) Thermal Diffusion Effects on Energy Transfer in a Turbulent Boundary Layer With Helium Injection; 4) Some Experiments on Impact-Pressure Probes in a Low-Density, Hypervelocity Flow; 5) "Orifice-Hot-Wire" Probe and Measurements of Wall Pressure Fluctuations; 6) Measurement of Radiation Configuration Factors With Parabolic Mirrors; 7) Viscous and Inviscid Stagnation Flow in a Dissociated Hypervelocity Freestream; 8) Steady Subsonic Drag in Nonequilibrium Flow of a Dissociating Gas; 9) Two-Phase Flow Through an Aperture; 10) Influence of Condensation of Water Vapor in Wind Tunnels on Heat Transfer and Recovery Temperature; 11) Turbulent Liquid Jet Intruding Into a Boiling Stream; 12) Nucleation and Boiling From a Liquid-Liquid Interface; 13) Photographic Study of Bubble Dimensions and Boiling Action on Mercury and Standard Engineering Surfaces; 14) Measurements of Drag and Wake Structure in Magneto-fluid-Dynamic Flow About a Sphere; 15) Interaction of a Plasma Jet With a Magnetic Field; 16) Slip Flow in the Entrance Region of a Parallel Plate Channel; 17) Shock-Boundary Layer Interaction and Flow Separation; 18) Study of Shock Impingements on Boundary Layers at Mach 16; 19) Theoretical Study of the Hydrogen-Air Reaction for Application to the Field of Supersonic Combustion.

This volume constitutes the proceedings of a meeting held at the University of Washington, June 13-15, 1962. This paperback is a preliminary edition of the hardbound book, which will be published shortly.

Advances in Spectroscopy, edited by H. W. Thompson, *St. John's College, Oxford* (Interscience Publishers Inc., New York, 1961), Vol. 2, 483 pp. \$13.00.

Contents: 9 chapters contributed by different authors. 1) Application of Atomic Absorption Spectra to Chemical Analysis; 2) Spectra of Flames; 3) X-Ray Spectroscopy; 4) Nuclear Magnetic Resonance; 5) Infrared Spectra of Crystals; 6) Refraction of Gases in the Infrared; 7) Infrared Spectra of Micro-Organisms; 8) Ultraviolet Absorption Spectra of Proteins and Related Compounds; 9) Some

The books listed here are those recently received by the ARS from various publishers who wish to announce their current offerings in the field of astronautics. The order of listings does not necessarily indicate the editors' opinion of their relative importance or competence.

Recent Developments in the Theory of Molecular Energy Levels.

The volumes of this series are designed to fill the need for periodic authoritative surveys on recent progress in different branches of spectroscopy. The third volume is now in preparation.

Mechanics of Fluids, Irving H. Shames, *Professor and Chairman, Department of Engineering Science, Pratt Institute* (McGraw-Hill Book Co. Inc., New York, 1962), 555 pp. \$8.95.

Chapters: 1) Fundamental Notions; 2) Stress at a Point; 3) Fluid Statics; 4) Foundations of Flow Analysis; 5) Basic Laws for Systems and Control Volumes; 6) General Considerations of Irrotational Flow; 7) Dimensional Analysis and Similitude; 8) Two-Dimensional, Steady Irrotational Flow; 9) Axially Symmetric Incompressible Irrotational Flow; 10) Incompressible Viscous Flow; 11) Boundary Layer Theory; 12) Introductory Considerations for Compressible Flow; 13) One-Dimensional Compressible Flow; 14) Introduction to Multidimensional Compressible Flow; 15) Flow in Open Channels. *Appendixes:* 1) Proofs and Discussions; 2) Curves and Tables.

This theory textbook is supported with sample problems, examples, and discussions to illustrate the practical applications in the field. It is designed to be useful to aeronautical and mechanical engineers as well as to students.

Navigation Systems for Aircraft and Space Vehicles, edited by T. G. Thorne, *Royal Radar Establishment, Great Malvern, England* (Pergamon Press, Oxford, 1962), 550 pp. \$17.65.

Contents: 37 papers contributed by different authors and divided into 3 major parts. Part 1) Navigation Systems; Part 2) Air Traffic Control, Automatic Approach, and Landing; Part 3) Navigation in Space and Navigation on Earth Using Satellites.

This volume contains the papers presented at the AGARD Avionics Panel Meeting, held in Istanbul, October 3-8, 1960. It gives a broad review of new navigation systems and techniques and is intended to be used as a reference book for engineers and scientists engaged in the development of navigation aids in this field.

Space Flight Report to the Nation, edited by Jerry Grey and Vivian Grey (Basic Books Inc., New York, 1962), 224 pp. \$7.50.

Contents: 17 chapters contributed by different authors. 1) Sounding Rockets and Scientific Satellites; 2) Solar System Exploration; 3) Meteorological Applications; 4) Communications Applications; 5) Manned Space Flight; 6) Space Vehicle Systems; 7) Chemical Rocket Propulsion; 8) Advanced Propulsion; 9) Guidance and Control; 10) Launch

Operations; 11) Special Problems; 12) Military Effects; 13) Political Effects; 14) Industrial Economic Effects; 15) International Cooperation; 16) Extraterrestrial Contact; 17) Critical Evaluation of the Space Race.

This book recapitulates the American Rocket Society's effort to inform the American people of our rapidly accelerating space program and sums up the status of astronautics as it exists today. The editors have provided explanatory sections to clarify the technical information.

Optimization Techniques, With Applications to Aerospace Systems, edited by George Leitmann, *Applied Mechanics Group, Mechanical Engineering Department, University of California, Berkeley* (Academic Press, New York, 1962), 453 pp. \$16.00.

Contents: 14 chapters contributed by different authors. 1) Theory of Maxima and Minima; 2) Direct Methods; 3) Extremization of Linear Integrals by Green's Theorem; 4) Calculus of Variations in Applied Aerodynamics and Flight Mechanics; 5) Variational Problems With Bounded Control Variables; 6) Methods of Gradients; 7) Pontryagin Maximum Principle; 8) Determination of Optimal Trajectories Via Dynamic Programming; 9) Computational Considerations for Some Deterministic and Adaptive Control Processes; 10) General Imbedding Theory; 11) Impulsive Transfer Between Elliptical Orbits; 12) Optimum Spacing of Corrective Thrusts in Interplanetary Navigation; 13) Propulsive Efficiency of Rockets; 14) Some Topics in Nuclear Rocket Optimization.

This book is intended to be of interest to engineers, scientists, and applied mathematicians whose training need not have progressed past the first graduate year of a standard engineering curriculum. Highly technical terminology has been avoided in order to make the subject matter accessible to the widest possible audience.

Progress in International Research on Thermodynamic and Transport Properties, edited by Joseph F. Masi, *Air Force Office of Scientific Research*, and Donald H. Tsai, *National Bureau of Standards* (American Society of Mechanical Engineers and Academic Press, New York, 1962), 762 pp. \$24.00.

Contents: 68 papers written by different authors and divided into 9 major parts. Part 1) Thermodynamic Properties: Reviews and Theoretical Investigations; Part 2) Thermodynamic Properties: Experimental Investigations; Part 3) Thermodynamic Properties: Computational Methods; Part 4) Transport Properties: Reviews and Theoretical Investigations; Part 5) Intermolecular Forces; Part 6) Transport Properties: Measurement of Thermal Conductivity; Part 7) Transport Properties: Measure-

ments of Viscosity and Radiation; Part 8) Properties of Ionized Gases; Part 9) Properties of Non-Newtonian Fluids.

This volume constitutes the Proceedings of the Second Symposium on Thermophysical Properties, sponsored by the American Society of Mechanical Engineers. The papers are the result of an attempt to gather together a representative body of symposium speakers on recent research in all the areas of thermal and transport properties. The majority of the papers are by authors from disciplines other than engineering.

Advances in Aeronautical Sciences, edited by Th. von Karman, A. M. Ballantyne, G. Bock, R. R. Dexter, H. L. Dryden, and M. Roy (Pergamon Press, Oxford, and Macmillan Company, New York, 1962), Vols. 3 and 4, 1208 pp. total. \$45.00 for set.

Vol. 3, Contents: 28 papers contributed by different authors on such subjects as the use of shock tunnels for research on hypersonic flow, some aspects of boundary layer transition at subsonic speeds, jet thrust, and the effect of a shock wave on a burning solid propellant.

Vol. 4, Contents: 30 papers contributed by different authors on such subjects as the aerodynamics of jet flaps, protection of aircraft structures against high temperatures, transient thermal stresses in viscoelastic plates and shells, and guidance of space vehicles by radio measurements and command.

These two volumes contain the Proceedings of the Second International Congress in the Aeronautical Sciences, held in Zurich, September 12-16, 1960. All national organizations in the world which are devoted to the aeronautical sciences were invited to participate in the Congress, the purpose of which was to form a worldwide forum for the discussion of common problems in aerospace technology.

Science and Information Theory, Leon Brillouin, *Member of the National Academy of Sciences* (Academic Press, New York, 1962), 2nd ed., 347 pp. \$9.00.

Chapters: 1) Definition of Information; 2) Application of the Definitions and General Discussion; 3) Redundancy in the English Language; 4) Principles of Coding, Discussion of the Capacity of a Channel; 5) Coding Problems; 6) Error Detecting and Correcting Codes; 7) Applications to Some Special Problems; 8) Analysis of Signals: Fourier Method and Sampling Procedure; 9) Summary of Thermodynamics; 10) Thermal Agitation and Brownian Motion; 11) Thermal Noise in an Electric Circuit; Nyquist's Formula; 12) Negentropy Principle of Information; 13) Maxwell's Demon and the Negentropy Principle of Information; 14) Negentropy Principle of Information in General Physics; 15) Observation and Information; 16) Information Theory, the Uncertainty Principle, and Physical Limits of Observation; 17) Negentropy Principle of Information in Telecommunications; 18) Writing, Printing, and Reading; 19) The Problem of Computing; 20) Information, Organization, and Other Problems; 21) Inevitable Errors, Determinism, and In-

formation; 22) The Problem of Very Small Distances.

This book is based on lectures delivered by the author to engineers and at different universities. It is designed to be of value to anyone who wishes to familiarize himself with the ideas of the relatively new science of information theory.

Elements of Queueing Theory, With Applications, Thomas L. Saaty, *Office of Naval Research* (McGraw-Hill Book Co. Inc., New York, 1961), 423 pp. \$11.50.

Chapters: 1) Description of Queues; 2) Some Queueing Models; 3) Probability, Markoff Chains and Processes, Ergodic Properties of Queues; 4) The Birth-Death Process in Queueing Theory; 5) The Case of Small Barriers; 6) Special Non-Poisson Cases; 7) Bulk Queues; 8) Poisson Input, Arbitrary Service Distribution, Distributions of the Number in the System, the Busy Period, and the Number Served; 9) Poisson and Arbitrary Input, Arbitrary Service, the Waiting Time for Single and Multiple Channels; 10) General Independent Input, Exponential or Erlangian Service; 11) Other Queue Disciplines; 12) Queues in Tandem or Series; 13) Interesting Queueing Phenomena; 14) Applications; 15) Basic Renewal Theory

The principal purpose of this book is to produce a general text and a summary of scattered papers and monographs on the subject of queues. It is intended for graduate students with a good background in basic calculus, probability, introductory complex variable theory, and matrix theory, but it also can be used by research workers.

Dynamics of Atmospheric Entry, Robert Clifton Duncan, *Commander, U. S. Navy, and Staff Assistant to Director of Defense Research and Engineering* (McGraw-Hill Book Co. Inc., New York, 1962), 306 pp. \$12.50.

Chapters: 1) Survey of the Atmospheric-Entry Problem; 2) Gravitation and the Figure of the Planet; 3) Three-Dimensional Kinematics; 4) Kinematics in Elliptical Parameters; 5) Vehicular Forces; 6) Planar Motion; 7) Trajectory Constraints; 8) Trajectory Phases and Boundary Conditions; 9) The Direct-Entry Profile; 10) The Degenerate-Orbital Profile. *Appendixes:* 1) Coordinate Frames and Glossary; 2) Physical Characteristics of the Solar System; 3) Atmosphere of the Planets; 4) Externally Aided Adaptive Control; 5) Bibliography.

The principal aim of this volume is to place at the disposal of the engineer or physicist the basis of an intelligent working knowledge of physical phenomena associated with entry of astronomical vehicles into planetary atmospheres. The book may serve as an introduction to the subject, and it also may be of value to the graduate student or the working scientist or engineer.

Surface Phenomena in Metals and Alloys, V. K. Semenchenko, edited by R. Kennedy, *Lecturer in Metallurgy, Royal College of Science and Technology, Glasgow*, translated by N. G. Anderson (Pergamon Press

Ltd., Oxford, and Addison-Wesley Publishing Co. Inc., Reading, Mass., 1962), 466 pp. \$14.75.

Chapters: 1) Surface Phenomena in One-Component Systems; 2) Experimental Methods of Determining Surface Tension; 3) Experimental Results of the Determination of the Surface Tension of Pure Metals; 4) Thermodynamics of Surface Phenomena in Two-Component Solutions and Mixtures; 5) Molecular Statistical Theory of Surface Phenomena in Solution; 6) Surface Phenomena in Multicomponent Mixtures; 7) Surface Tension of Metallic Solutions; 8) Surface Tension of Binary Systems; 9) Surface Phenomena in Solids; 10) Modification of Metals and Alloys by Minor Impurities as a Surface Phenomenon; 11) The Theory of the Surface Tension of Metals; Some Empirical Formulae.

This translation from the Russian emphasizes subjects of immediate interest to those working on practical problems of metallurgy. It is designed to be of value to metallurgists and other engineers concerned with materials and also to those working in the fields of molecular physics and physical chemistry.

Advances in Applied Mechanics, edited by H. L. Dryden and Th. von Karman (Academic Press, New York, 1962), Vol. 7, 327 pp. \$11.00.

Contents: 4 sections contributed by different authors. Section 1) Hypersonic Flow Over Slender Bodies Associated With Power-Law Shocks, by Harold Mirels; Section 2) Mathematical Theory of Equilibrium Cracks in Brittle Fracture, by G. I. Barenblatt; Section 3) Plasticity Under Nonhomogeneous Conditions, by W. Olszak, J. Rychlewski, and W. Urbanowski; Section 4) Some Elementary Problems in Magnetohydrodynamics, by Raymond Hide and Paul H. Roberts.

The first three sections of this volume contain reviews of topics in solid mechanics and an account of recent analytical results obtained in the field of hypersonic obstacle flow. The final section may serve as an introduction into the comparatively new field of magnetohydrodynamics.

Advances in Space Science and Technology, edited by Frederick I. Ordway III, *NASA George C. Marshall Space Flight Center, Huntsville, Ala.* (Academic Press, New York, 1962), Vol. 4, 431 pp. \$14.00.

Contents: 6 chapters contributed by different authors. 1) Doppler Effect of Artificial Satellites; 2) Possibilities of the Existence of Extraterrestrial Intelligence; 3) Development of Multiple Staging in Military and Space Carrier Vehicles; 4) Spacecraft Entry and Landing in Planetary Atmospheres; 5) Development of Manned Artificial Satellites and Space Stations; 6) Utilization of Radioactive Elements as Energy Sources for Spacecraft Propulsion.

The chapters in this book examine vital areas of basic and applied astronautics. This volume emphasizes progress made since the publication of the third volume a year ago.

Molecular Biophysics, Richard B. Setlow, *Oak Ridge National Laboratory*, and Ernest C. Pollard, *Pennsylvania State University* (Addison-Wesley Publishing Co. Inc., Reading, Mass., 1962), 545 pp. \$11.75.

Chapters: 1) Physics and Biology; 2) The Biophysicist's View of the Living Cell; 3) Energetic and Statistical Relations in the Living Cell; 4) Physical Methods of Determining the Sizes and Shapes of Molecules; 5) X-Ray Analysis and Molecular Structures; 6) Intramolecular and Intermolecular Forces; 7) Absorption Spectroscopy and Molecular Structure; 8) Enzymes; 9) Action Spectra and Quantum Yields; 10) Action of Ionizing Radiation on Cellular Constituents; 11) Use of Ionizing Radiation to Study Cell Structure; 12) Microscopes; 13) Isotopic Tracers in Molecular Biophysics; 14) Molecular Biophysics and Muscle, Nerve, and Eye Studies; 15) The Physics of Cellular Processes.

This textbook, written at the advanced undergraduate level, explains the properties of biological systems and phenomena in terms of the properties of molecules, both small and large. The emphasis throughout is both theoretical and experimental.

Handbook of Nonparametric Statistics—Investigation of Randomness, Moments, Percentiles, and Distributions, John E. Walsh, *System Development Corporation* (D. Van Nostrand Co. Inc., Princeton, N. J., 1962), 549 pp. \$15.00.

Chapters: 1) Outline and Scope of Handbook; 2) Standardized Notation; 3) Description and Use of Format; 4) Discussion of Concepts and Special Terminology; 5) Tests of Randomness; 6) Tchebycheff Type Inequalities; 7) Estimates and Tests for Expected Values; 8) Estimates and Tests for Population Percentiles; 9) Distribution-Free Tolerance Regions; 10) Nonsequential Results for Distributions From Ungrouped Data; 11) Sequential Decision, and Categorical Data Results for Distributions.

This handbook presents a large number of nonparametric probability information procedures of practical significance in

scientific research today. The methods used are widely applicable to the data of science, engineering, medicine, and other related fields.

Handbook of Engineering Mechanics, edited by W. Flugge, *Professor of Engineering Mechanics, Stanford University* (McGraw-Hill Book Co. Inc., New York, 1962), 1st ed., 1632 pp. \$27.50.

Contents: 88 chapters contributed by different authors and divided into 7 major parts. Part 1) Mathematics; Part 2) Mechanics of Rigid Bodies; Part 3) Theory of Structures; Part 4) Elasticity; Part 5) Plasticity and Viscoelasticity; Part 6) Vibrations; Part 7) Fluid Mechanics.

This handbook is designed to be a valuable timesaver for work in engineering, designing, and graduate-level study in mechanics. It contains over 1000 diagrams, charts, tables, and graphs, thus making it a useful tool for engineers and students in any field concerned with the efficient solution of applied mechanics problems.

Technical Literature Digest

M. H. Smith, *Associate Editor*

The James Forrestal Research Center, Princeton University

Propulsion and Power (Combustion Systems)

A Method for the Determination of Local Transient Heat Flux in Uncooled Rocket Motors, W. B. Powell, G. W. Howell, and J. P. Irving. *Calif. Inst. Tech., Jet Propulsion Lab. TR 32-257* (supersedes Memo. 20-154), July 1, 1962, 26 pp.

Effects of Selected Gas Stream Parameters and Coolant Physical Properties of Film Cooling of Rocket Motors, D. L. Emmons. *Purdue Univ., Jet Propulsion Center Rept. TM-62-5*, Aug. 1962, 132 pp.

Elastic Stresses and Displacements Induced in Solid Propellant Rocket Motors by Transverse Gravity Forces, G. F. Gillis. *Rohm & Haas Co., Redstone Arsenal Research Div. Rept. P-62-13* (Quart. Progr. Rept. on Eng. Research, March 15–June 15, 1962), July 25, 1962, 64 pp.

An Experimental Investigation of Longitudinal Combustion Pressure Oscillations, J. R. Osborn and R. L. Derr. *Purdue Univ., Jet Propulsion Center (Interim Rept. 6), Rept. I-62-8*, Aug. 1962, 50 pp.

A Use of Conformal Mapping to Determine the Apparent Additional Mass of Scaloped and/or Clustered Cylinder Configurations with Experimental Evaluations of Results, C. E. Watkins, D. L. Lansing, and F. W. Gibson. *NASA TN D-1373*, Sept. 1962, 33 pp.

Study of Rocket Engine Exhaust Products. Gabriel Co., Rocket Power Inc. Fourth Quart. Rept., April 1, 1962–

June 30, 1962 (including Annual Summary), 36 pp.

On the Maintenance of Chemical Equilibrium During the Expansion of Reacting Gas Mixtures, the Optimum Nozzle Design, J. P. Appleton. *Southampton Univ., Aeronaut. and Astronaut. Rept. 216*, March 1962, 16 pp. (AF ARL 62-385; AF ARL TN-13).

Propulsion and Power (Noncombustion)

Reactor-Weight Study of Beryllium Oxide, Beryllium, Lithium-7 Hydride and Water as Moderators with Tungsten 184 Structural Material and Uranium Dioxide Fuel, R. E. Hyland. *NASA TN D-1407*, Sept. 1962, 41 pp.

Flux Depression and Fission-Fragment Escape in a Gaseous Core Reactor, D. F. Spencer. *Calif. Inst. Tech., Jet Propulsion Lab. TR 32-278*, July 31, 1962, 23 pp.

Nuclear Electric Spacecraft for Unmanned Planetary and Interplanetary Missions, D. F. Spencer, L. D. Jaffe, J. W. Lucas, O. S. Merrill, and J. I. Shafer. *Calif. Inst. Tech., Jet Propulsion Lab. TR 32-281*, April 25, 1962, 11 pp.

Experimental Determination of Spectral and Total Transmissivities of Clouds of Small Particles, C. D. Lanzo and R. G. Ragsdale. *NASA TN D-1405*, Sept. 1962, 41 pp.

Solar-Cell Power Systems for Space Vehicles, N. W. Snyder. *IRE Trans. Military Electron. MIL-6*, 84–91 (Jan. 1962).

Estimate of Space-Radiation Effects on Satellite Solar-Cell Power Supplies, J. M. Denney, R. G. Downing, S. R. Lackman, and J. W. Oliver. *IRE Trans.*

Military Electron. MIL-6, 14–20 (Jan. 1962).

The Present Status of Silicon Solar Cells, P. A. Iles. *IRE Trans. Military Electron. MIL-6*, 5–14 (Jan. 1962).

Determination of Focusing Properties of Solar Collectors by an Integral Formula, P. Mazur. *Solar Energy* 6, 23–26 (1962).

Spectral and Directional Thermal Radiation Characteristics of Selective Surfaces for Solar Collectors, D. K. Edwards, J. T. Gier, K. E. Nelson, and R. D. Roddick. *Solar Energy* 6, 1–8 (1962).

Solar Direct-Conversion Power Systems, W. C. Cooley. *IRE Trans. Military Electron. MIL-6*, 91–98 (Jan. 1962).

Thermionic Conversion—State of the Art, T. Jarvis. *IRE Trans. Military Electron. MIL-6*, 41–45 (Jan. 1962).

The Use of High- and Low-Thrust Propulsion in Combination for Space Missions, T. N. Edelbaum, J. Astronaut. Sci. 9, 49–54 (Summer 1962).

Nuclear-Electric Spacecraft Concepts for Unmanned Planetary Exploration, R. J. Beale. *IRE Trans. Space Electron. Telemetry SET-8*, 178–182 (1962).

Electric Thrust Device Requirements for Interplanetary Spacecraft, J. H. Molitor and D. G. Elliott. *IRE Trans. Space Electron. Telemetry SET-8*, 183–187 (1962).

Potentialities of Electron Bombardment Ion Engines for Electric Propulsion, D. J. Kerrisk. *IRE Trans. Space Electron. Telemetry SET-8*, 188–193 (1962).

The Anodes of Thermoelectric Converters, V. G. Bol'shov and A. A. Zharinov. *Soviet Phys.—Tech. Phys.* 7, 152–155 (1962).

Analytical and Experimental Studies to

EDITOR'S NOTE: Contributions from Professors E. R. G. Eckert, E. M. Sparrow, and W. E. Ibele of the Heat Transfer Laboratory, University of Minnesota, are gratefully acknowledged.